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The Surveillance Picture Visualisation and Display

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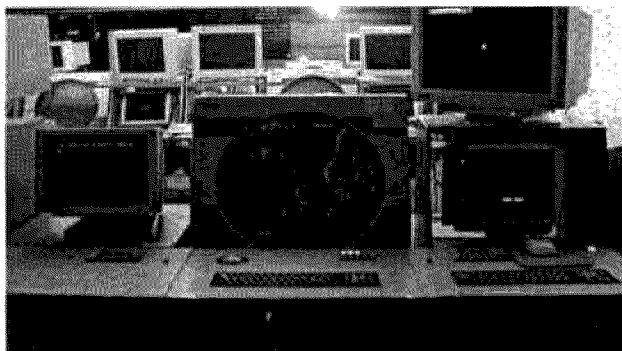Q115, DERA Malvem St Andrews Road Malvem Worcestershire UK, WR14 3PS

Summary: The aim of this paper is to outline some of the work carried out at DERA Malvem about visualisation and display issues associated with the surveillance picture. It will describe some of the current surveillance pictures in use in NATO, outline the application of symbology in the air picture, and then describe how visualisation can help the identification officer.

The Operations Room: The first figure below depicts the operations room, in which the operations process has remained largely unchanged for over 50 years.

Operations Room from 1940s

The UK operations room, responsible for producing the surveillance picture, is shown in the second figure. It is comprised of a 4-colour picture display with tote information on tabular display screens. It was designed in the 1970s during the Cold War, developed in the 1980s, and introduced into service during the mid 1990s, and was effectively obsolete by 2000. However it is regarded as state of the art by many countries who use systems more akin to the first figure.
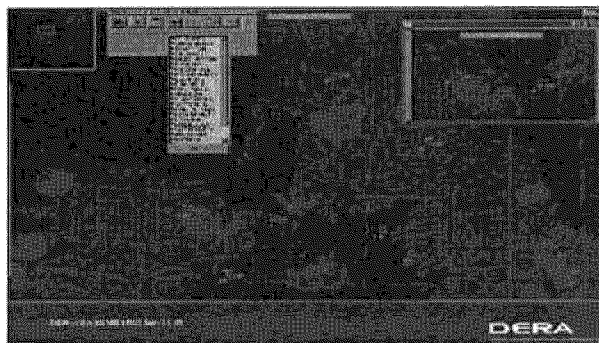

RAF Ops Room 2000 ICCS

However there are still serious issues concerning the new system:

- The system relies on the user spending up to ten minutes customising the display to suit their own preferences.
- Visualisation tools such as air routes are not individually selectable, so the user is presenting with all the information.
- Limited choice of colour in the display
- Information presented in large tables can obscure changes in the data.
- The operator currently has to switch the display between selected areas.

A current prototype developed by DERA illustrates a more practical approach to the HCI design. It consists of a large map, accompanied by two smaller inset maps, which aid navigation around the map, without losing the visibility of the data.

Subsets of the data may be displayed or hidden by use **of** a pull down list. The colour scheme used in this prototype highlights data that is applicable to the current user's role. Other data, not applicable to the role, is also presented but is dimmed so that it does not distract the **usr.**

Symbology: The key to operational success in all fields of air operations is situation awareness, and the aim of symbology is to assist the operator achieving this situational

Future Surveillance HCI

awareness. It is difficult to quantify how situational awareness is achieved; in its simplest form on a surveillance picture it is the ability of the operator to scan the picture and get a feeling of the relative disposition of forces and their location. The use of a well-conceived symbology can make this task significantly easier.

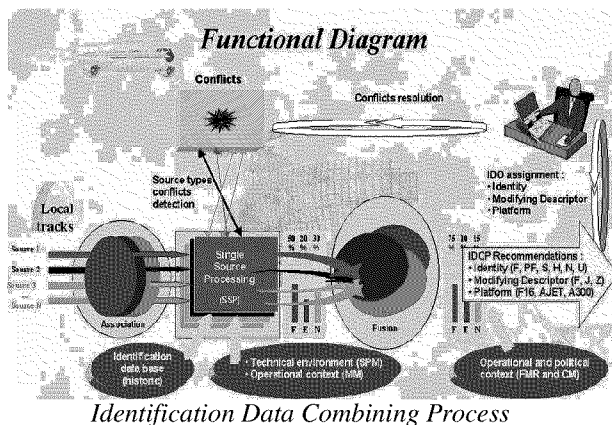In order to develop a symbology set the following need to be considered:

- Examine me standards, track categories and the definitions of what constitutes a track.
- Determine the structure of the symbol. This structure can either reflect the category of the track eg a hostile tack could be seen as 'h'. Alternatively the track could represent the platform type eg small aircraft symbol for a fighter, large for a transport ac etc.
- Add appropriate colours, shapes to give us the common symbology set.
- Add explanatory detail, e.g. track identifiers, direction of track, number of aircraft, etc.

There is confusion in the use of symbology in general and Air C2 systems specifically,

- Clarity in the use of Categories and Identities.
- Emergence of a de facto standard (e.g. on the E-3 aircraft) that does not align with any of the current NATO standards.
- Loss in the value of data that is translated between systems.
- No adoption of recognised colour groups in relation to Category

Visualisation in air target Identification through data fusion. Most aircraft identification is carried out without the clear picture on the left. Even if you see an aircraft with the mark 1 eyeball it may be at a distance, in bad weather or in a difficult profile.
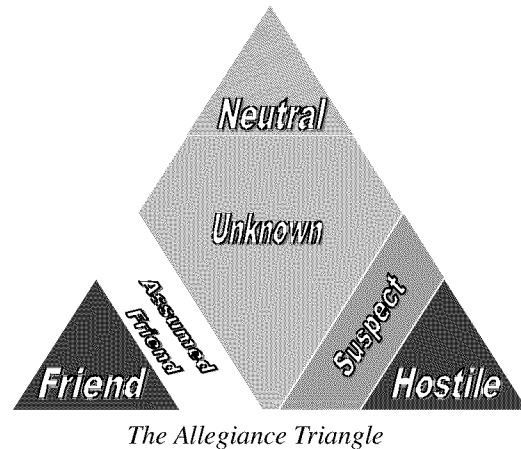
The reality is that the identification operator may only have a plot or a track on the screen that has been initiated form one or several different data sources. Often these sources may not have been fused, and manual correlation has to be carried out.

Identification Data Combining Process

A fully fused system can provide the operator with visual aids to target identification from a number of data sources. The diagram below illustrates the process whereby data from the sources is used to produce a recommendation based on the identification data combining process (IDCP).

Visual cues are provided to the operator in both anautomatic and manual processes. By selecting a data source the operator can view the system-generated probabilities of identification allegiance. Here the system probabilities are critical a define exactly where the dot will appear, in a system based upon the concept illustrated below.

This whole area of data fusion, IDCP and visualisation aids for the operators has been tested by Nato operators in a simulated exercise in France.

The Allegiance Triangle

While there was much discussion on the setting of the IDCP factors, the comments from the operators on the visualisation aspects of the system were most favourable:

- Air picture displays need to reflect available visualisation technologies.
- There needs to be a commonality of visual data presented to the operator (symbols, colours etc)
- New technologies such as data fusion will bring greater visualisation possibilities such as IDCP and the Allegiance Triangle.
- Internet and Intranet technologies should be integrated into the operator's workspace.

Discussion – Paper 7

Current and future air picture tech
Symbology
Data fusion

Current UK system problems?
We live in the dark, do we need to?
Dumb system – takes a long time to get the system back up after crashes, could there be a swipe card?
Limits to visualisation tools
Colour discrimination
Hidden info
Single display

2003 – use of color and transparency to highlight map
Call up displays of interest – weather for example

Objects must be displayed in real time

Symbology used to assist the operator in achieving situation understanding
Symbology set, standardized, labeling
Currently there is loss in the value of data when it is translated between systems, use of symbology not consistent with NATO standards

Need to standardize categories, colors, symbols

Need electronic online visual assistant
-   Intelligence and tactics
-   Simulation
-   Manning
-   Help

Need air picture displays
Need commonality

Speed up procurement procedures
Video conferencing and passing screen shots